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(71) Applicants
První Brněnská Strojírna
Koncernový Podnik
(Czechoslovakia),
Brno,
Czechoslovakia
(72) Inventors
Ladislav Podmela
František Musil
Zdeněk Sládek
Miloslav Bursa
(74) Agent and/or
Address for Service
Matthews, Haddan and
Co.,
Haddan House,
33 Elmfield Road,
Bromley,
Kent BR1 1SU

(54) Gearing

(57) Between cooperating transmission members 23, 24 in corresponding combined transfer grooves 21, 22, transfer elements 19 are uniformly placed and turningly located in guide member 30 which is turningly arranged between these transmission members. The guide member 30 is composed of a guide cage with regularly circularly arranged holes, in which are located the transfer elements.

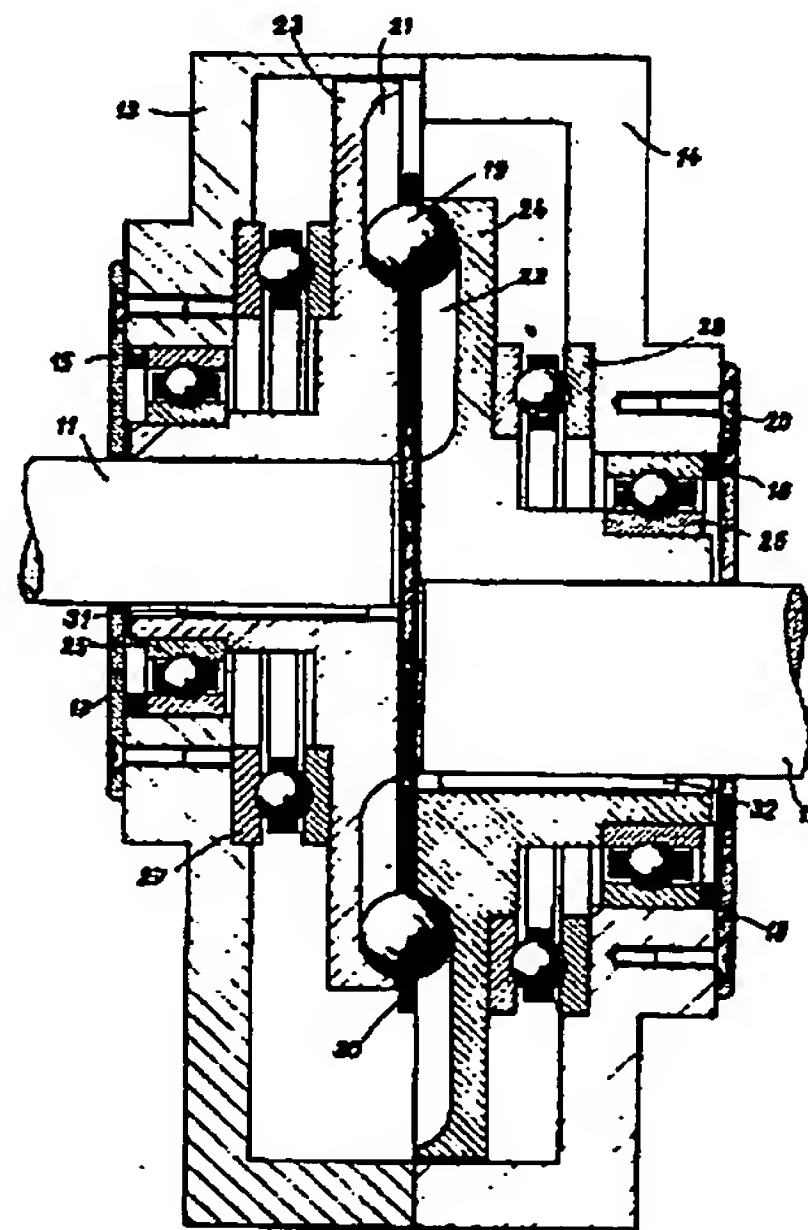


FIG. 1

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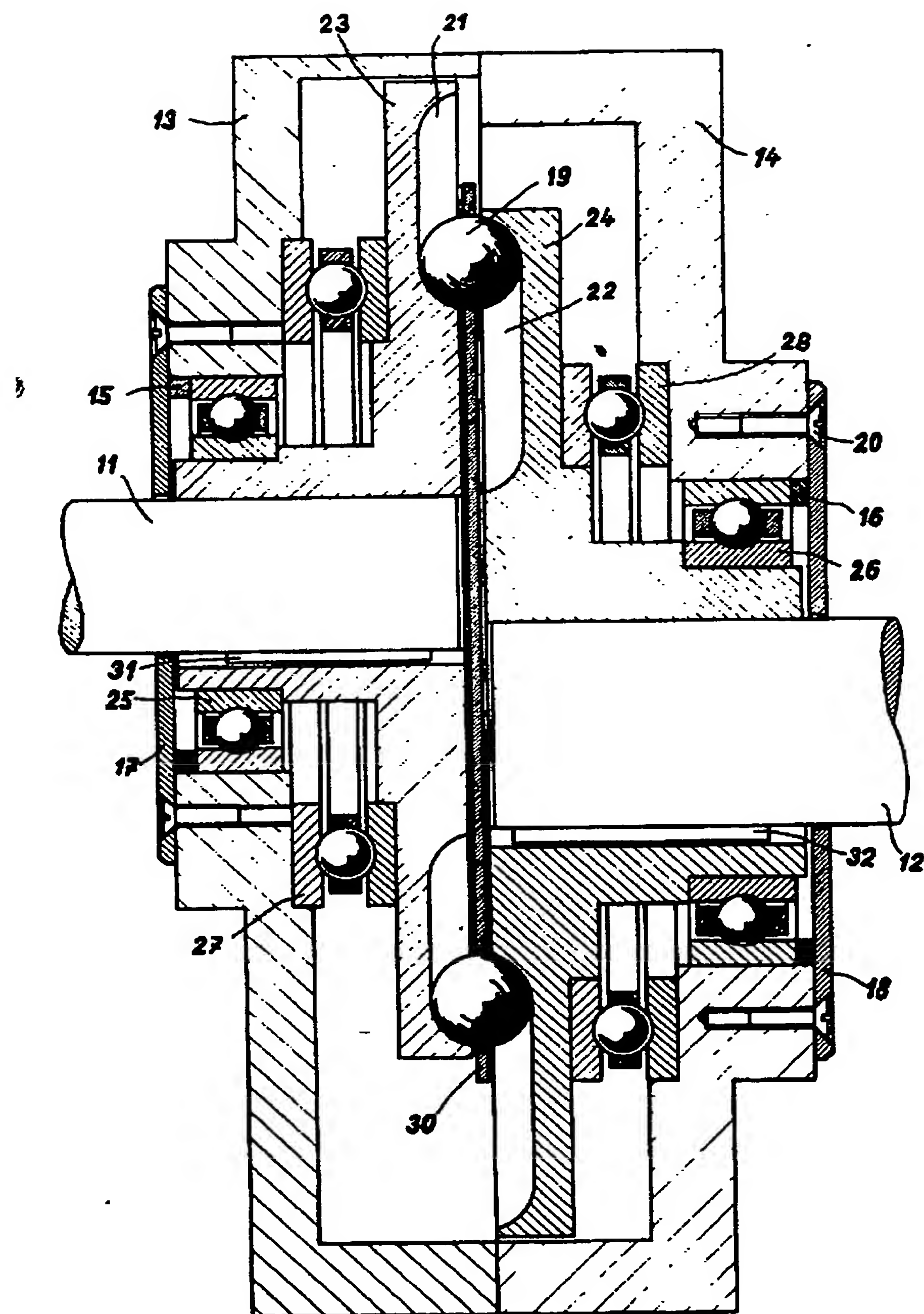


FIG. 1

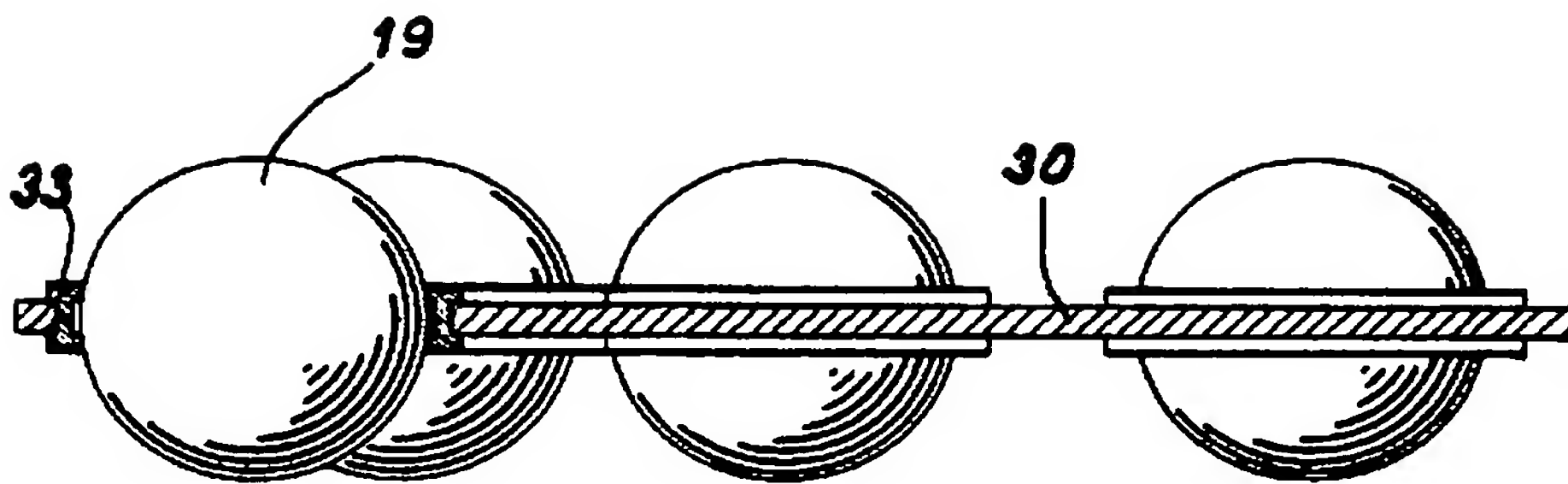


Fig. 2

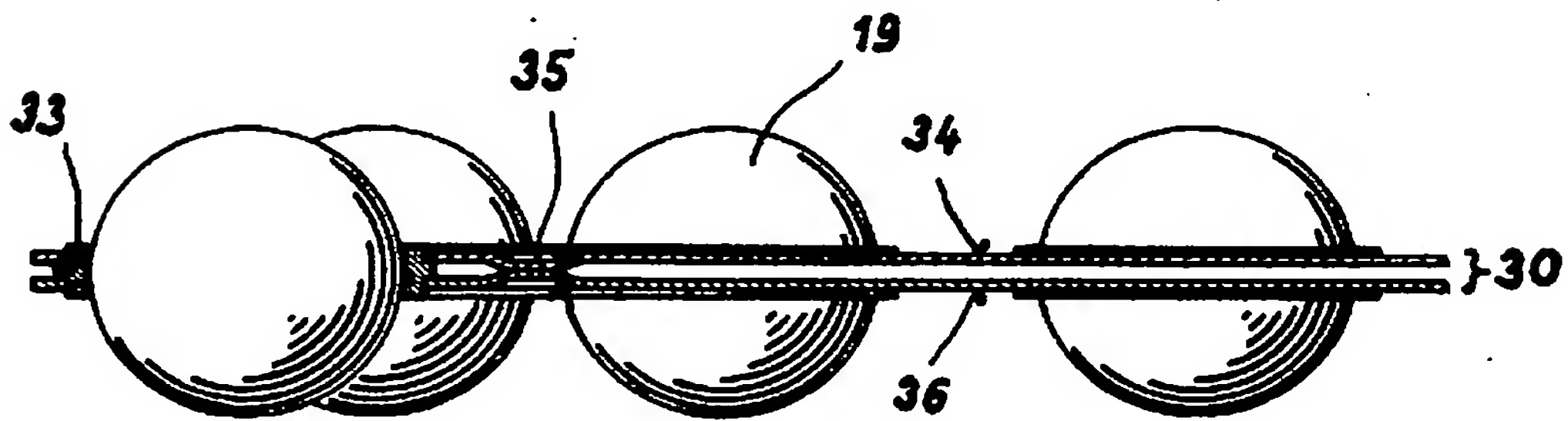


Fig. 3

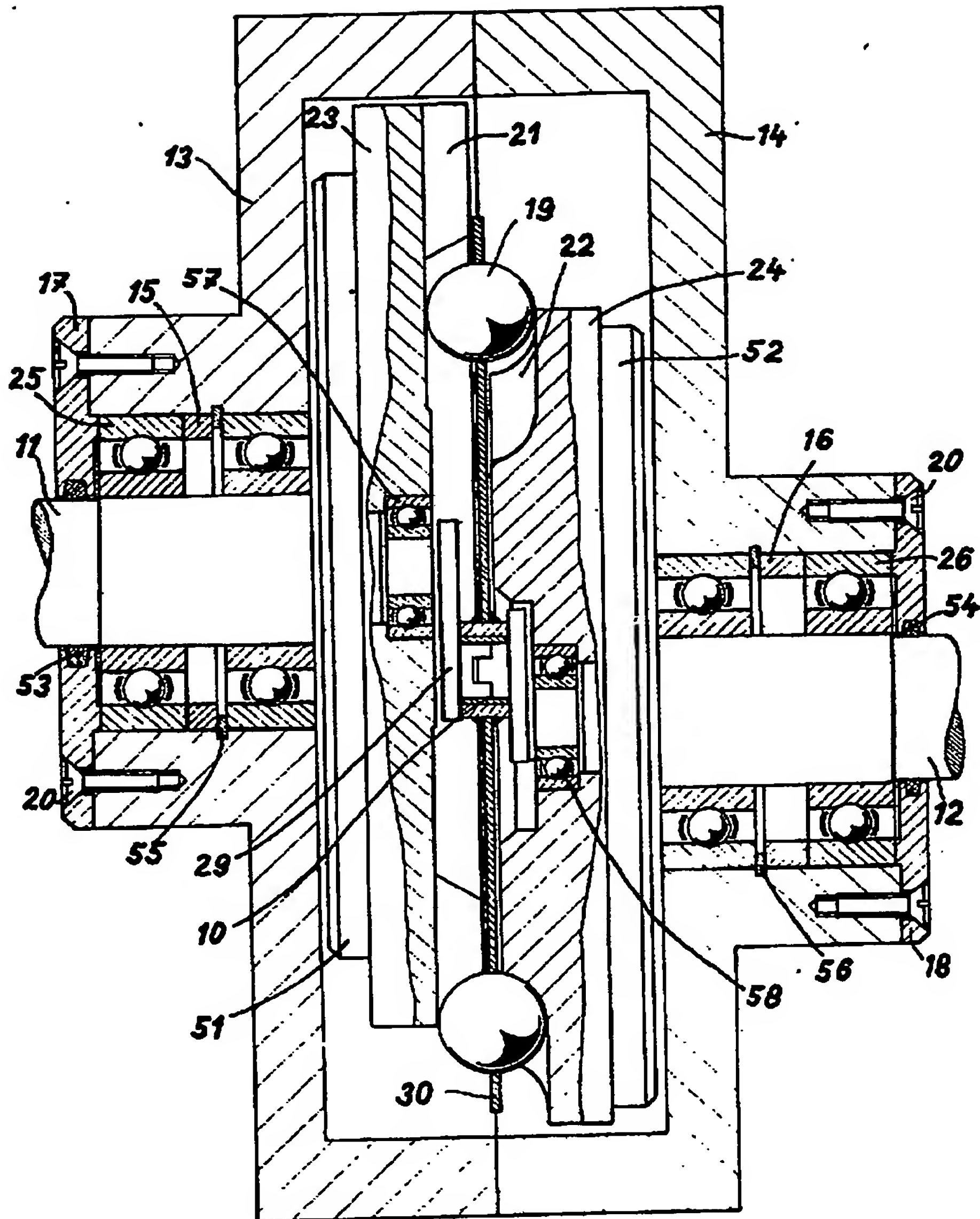
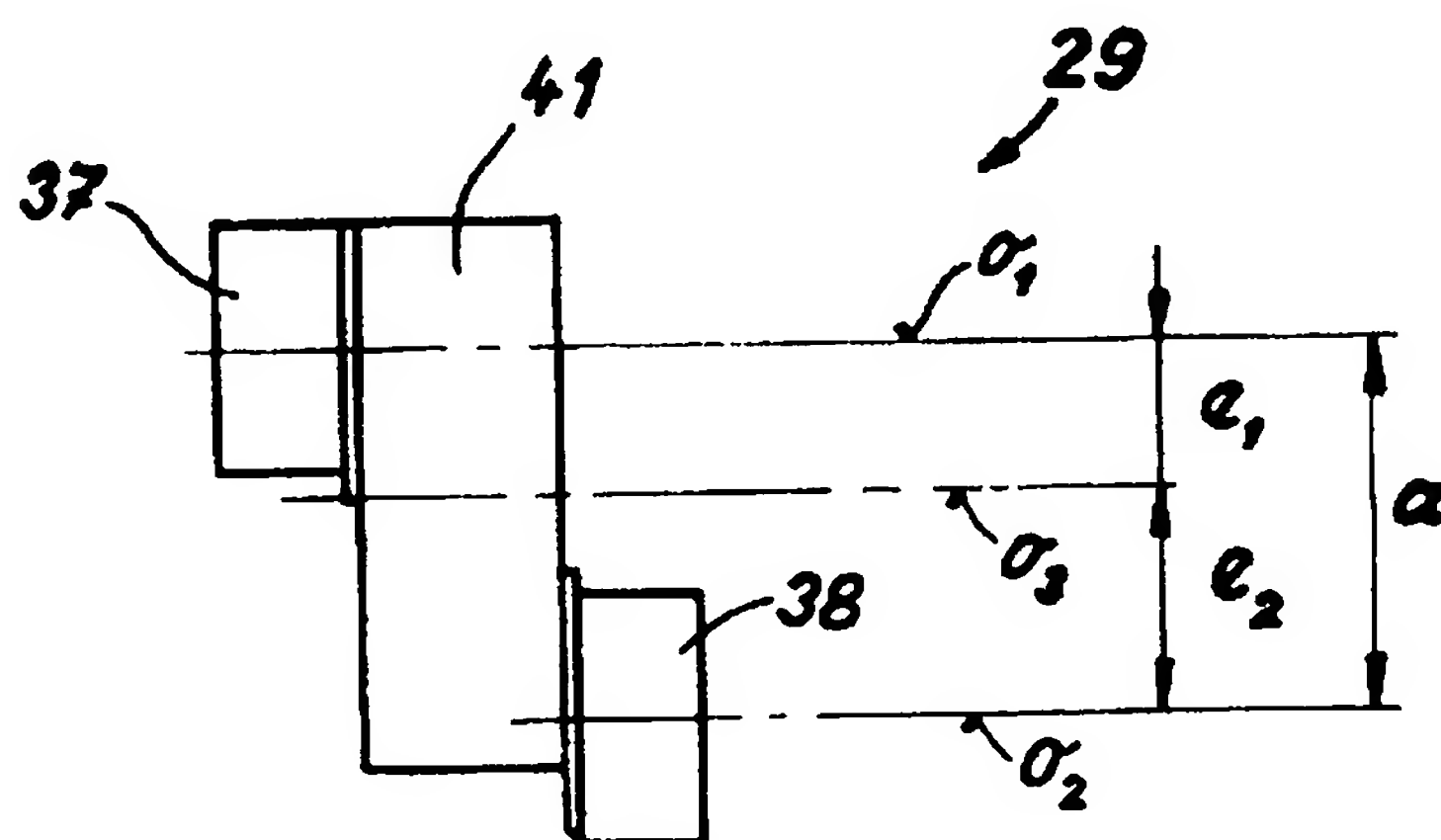
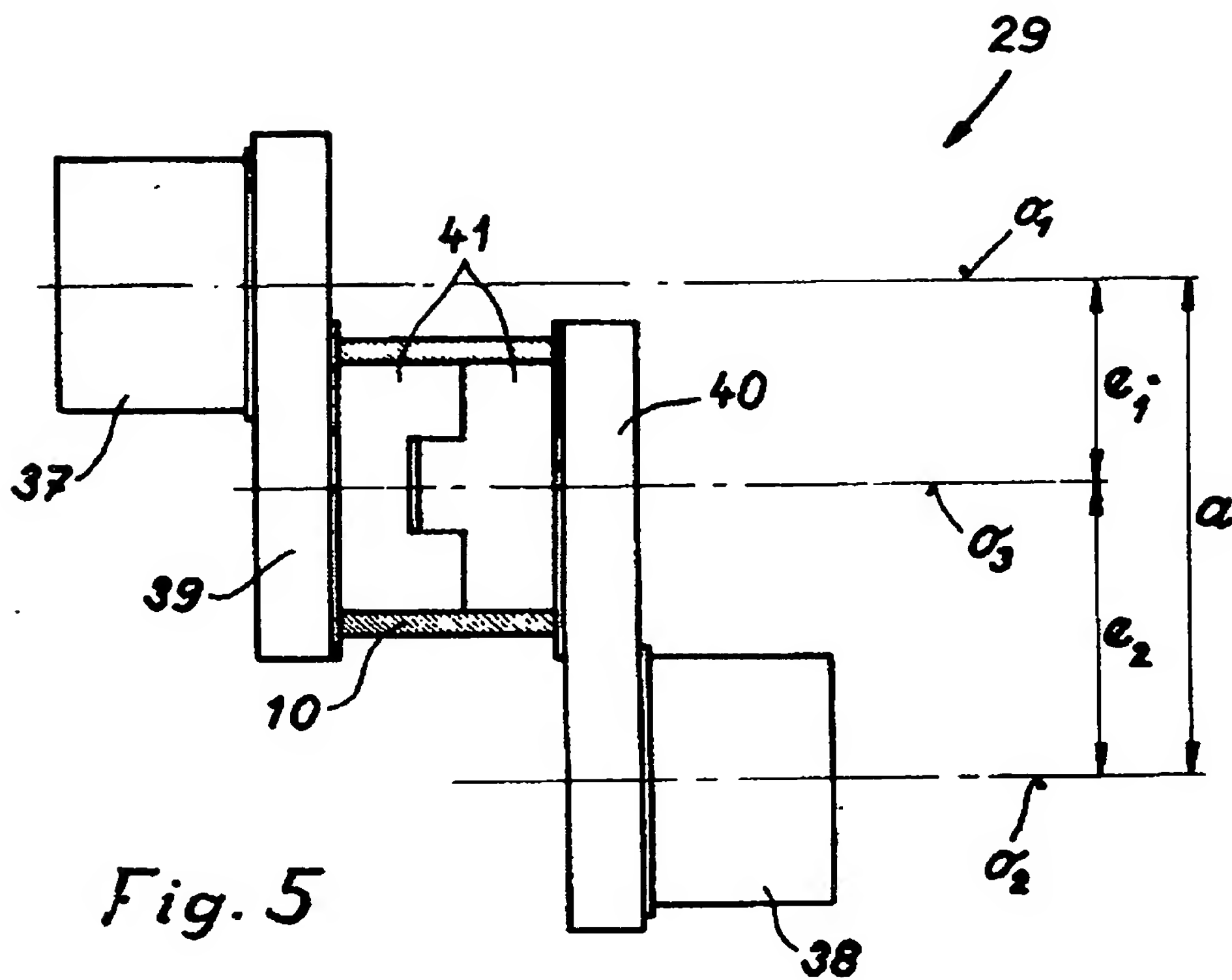


Fig. 4



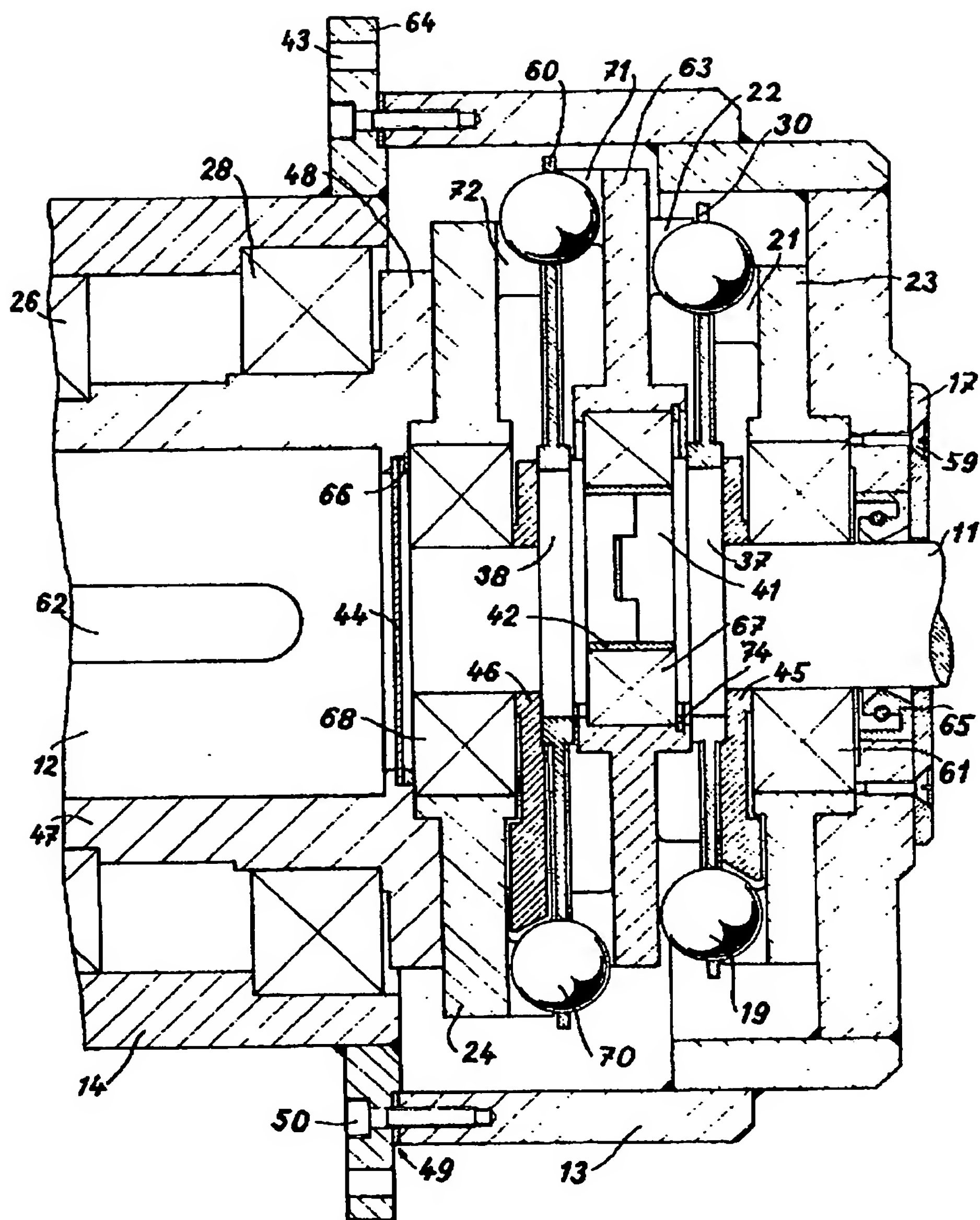


Fig. 7

SPECIFICATION

Gear equipment

5 The invention relates to a gear equipment for transfer and transformation of rotating motion, namely of middle and high torques.

When constructed machines and instrument mechanism it is often used a gearing, where the own transfer of rotating motion comes thus, that by engagement the teeth of one wheel fit into the teeth space of the other wheel, drive sides of teeth are bearing on and thus transfer a force and the torque from one wheel on the other. At the same time a kinematic gear ratio, which is defined as a ratio of angular speeds of the mating gears, must be mostly constant, the gearing cannot pulsate. To requirement of constancy of the gear ratio answers an unillustrated set of functional teeth surfaces and profiles. In practice now, it is only used an involute gear system and that because of production and operating reasons. But the claims on gear drives are still higher. With a gear mechanism it is still asked less dimensions and the weight with a growth of demands on transfer of higher and higher outputs, at the same time. It is quite impossible to comply with such demands in some cases, and so it happens to come in the certain technics area, that there is a shortage of the transfers. One of consequence of such a situation for instance is the necessity of branching of the great outputs at ship's gearbox, further gearboxes of rolling mills, and of hoisting and other heavy engines. Next consequence is an effort to utilize other physical principles for instance the hydraulic jet effects. With their utilization but always comes to very disadvantageous undirect transformations concerning a power system, what is inevitably combined namely with considerable loss. On the other hand in mechanical, direct transformation made through direct transfer of normal reactions in cooperating gear couples, doesn't come to such disadvantages.

Possibility of substantial increase of transfer parameters, namely of torques offers the rolling gears, where the normal reaction in every transmission couple are transferred through the transmission elements placed antifrictionally.

With the known rolling gears type CYCLO are these transmission elements as a matter of fact the supporting rollers, which are placed in every transmission couple on transfer pins of one transmission member and which are in one-sided rolling contact with one wave circuit of the second transmission member at once. In a planet constructional solution of these rolling transmissions, one of the transmission member is a fixed central ring with axially orientated and uniformly arranged transfer pins. The second transmission member with regard to maximum compensation of internal forces and also of the moments makes two kinematically mutually combined satellite cam disk, with epicycloid-hypocycloidly created circuit. Rolling transmission type CYCLO are really compact gearing, having little weight and

the dimensions. Further possibilities of increasing of outputs and turn parameters of these otherwise very good designs of rolling transmissions are however limited namely with disadvantageous internal forces distribution. Also with rolling toroidal gearing, where as well as with above mentioned epicycloid workmanship of the rolling gear type CYCLO are both driven and driving shaft mutually co-axial, have the transfer elements a form of the supporting rollers, which are in unilateral rolling touch with transfer grooves, created in two coaxially arranged transmission members. The first transmission member is a globoidal worm, which is placed on a driving shaft, the second transmission member is a stator rim which is again placed in a box of toroidal gearbox around this globoidal worm. In a torus space between the globoidal worm's outer circuit and the stator ring's internal circuit is placed a carrier ring which is tightly combined with the driven shaft. On the carrier ring are in regular pitches on respective carrier pins turningly located satellite wheels, on which are fastened radially arranged transfer pins with turningly located supporting rollers, intervening through transfer grooves created on globoidal worm's outer circuit and on stator ring's internal circuit.

Rugged and compact toroidal gearings make possible a transfer of really high torsional moments, have also a good efficiency and relatively low weight. But what is really disadvantageous is a great constructional complexity and limitation of revolutions with regard to high gyroscopical moments, effecting the satellite wheels and the transfer rollers.

Further considerable increasing of transfer parameters, namely of the torques, offer the face rolling gears described in Czechoslovak AO nos. 176,638 and 176,639 comprising the rolling transmission members, on mutually adjoining cooperating front faces provided with face transfer grooves with antifrictionally placed spherical transfer elements, have the mentioned transfer elements with transmission members in mutual rolling contact. At the same time the mentioned transfer elements are in an engagement area antifrictionally placed in the transfer grooves of both transmission members, outside the engagements area are these transfer elements with clearance placed partly in a transfer channel, which is created in a solid part of the rolling gear and partly in the transfer grooves of the transmission member, which is through its front surface, adjoined to this solid part.

Disadvantage of these face rolling gear known up to now is namely imperfect attaching of the transfer channel to engagement zone, a friction in transfer channel and further imperfect and inexplicit conducting of the transfer elements in the end positions of the transfer grooves.

The invention wants to make better the known rolling gears, which have presumptions for transfer and transformation of the high outputs by low and medium revolutions.

The present invention aims to eliminating the majority of the said disadvantages of the known

device. According to the invention between cooperating transmission members in corresponding combined transfer grooves the antifrictionally placed transfer elements are uniformly roudnessly spaced and turningly located in the guide gear, which is turningly arranged between these transmission members.

The face rolling gear according to the invention have a good influence upon reducing of noisiness and vibration, accompanying generating of the transfer elements along the orbit of transfer grooves on transmission members and namely the shocks arising at inlet and outlet of the transfer elements out of the engagement. In comparison with the known face rolling gears have those, according to the invention also less friction losses. Planet arrangement extends a utilization of the face rolling gears and also enables with mutual assembling reset of the transmission members to change a size of resulting gear ratio. For some utilizations is really great advantage of the planet arrangement according to the invention also a little axial depth and the possibility of adaptation for a rigid and backlash-free running.

A specific embodiment will now be described and explain with reference to the accompanying drawings. FIG. 1 shows an axial section through a face rolling gear with a free guide gear, FIG. 2 and FIG. 3 shows the axial sections through two further alternative arrangements of this free guide gear. FIG. 4 shows an axial section through the face rolling gear with a stabilized guide gear, FIG. 5 and FIG. 6 show two further alternative arrangements of its internal stabilization group, and FIG. 7 shows then an axial section through a planet face rolling gear.

For explanation of the first example of gear equipment according to the invention are here used FIG. 1, 2, 3. In a two-part box of the rolling gear according to FIG. 1, which consists of mutually face connected parts 13, 14 are turningly placed two mutual axially offset transmission members 23, 24 of a flange form, in mutually adjoining parallel plane face surfaces of which are created mutually combined cycloidal transfer grooves 21, 22 and in common face space of these transmission members 23, 24 is freely turningly placed the guide gear with turningly placed spherical transfer elements 19, bilaterally intervening into both transfer grooves 21, 22. At the same time the transfer grooves 21 on the first transmission member 23, like a pinion, have the forms of simple persycloids and the transfer grooves 22 on the second transmission member 24, created like a wheel, have the forms of simple hypocycloids. Both parts 13, 14 of the box are mutually attached and positioned through unillustrated connecting and fixating elements. In axial hole of the inlet transmission member 23, which is through antifriction bearings 25, 27 turningly placed in an inlet part 13 of the gear equipment, is located the end of the driving shaft 11, which is in this axial hole secured against moving round through a spring 31. Similarly in axial hole of the outlet transmission member 24, which is through antifriction bearings 26, 28 turningly placed in an outlet part 14 of the gear equipment is located the end of the driven shaft 12, secured against

moving round through a spring 32. The driving shaft 11 of internal spur gearing here described is parallel with the driven shaft 12 and a size of their mutual axial offset is here, as well as with internal spur gearing given by a difference of rolling radius. While the thrust bearings 27, 28 serve for catching of axial forces, the bearings 25, 26 are radial bearings. Positions of these radial bearings 25, 26 in both parts 13, 14 of the box are taken up through face shoulder on the transmission members 23, 24 and through faces of distance rings 15, 16 located in respective cylindrical bores of the parts 13, 14 and bearing on covers 17, 18, which are on external faces of both parts 13, 14 fastened through binder bolts 20.

On respective plane front surface of the transmission member 23 is created ten regularly spaced simple pericycloidal transfer grooves 21 with grinded gothic functional surfaces, and on adjoining plane front surface of the transmission member 24 is then created fifteen regularly spaced combined simple hypocycloidal transfer grooves 22, which also have grinded gothic functional surfaces.

The guide gear in the first alternative according to FIG. 1 consists of a simple guide cage 30 in a form of thin circular wheel with uniformly roudnessly spaced twelve circular holes, in which are turningly located spherical transfer elements 19. Diameter of a pitch circle of circular holes in the guide cage 30 is here in assembled state of the guide gear the same like a diameter of a harmonic circle, which conjugates rolling circles on the transmission members 23, 24 and in assembled state of the guide gear passes through centres of the transfer elements 19.

In such a workmanship is the first rolling diameter at the first transmission member 23 equivalent to ten length units, the second rolling diameter at the second transmission member 24 is equivalent to fifteen length units and a pitch diameter of holes in the cage 30, which is here the same like a harmonic diameter of both rolling diameters, is equivalent to twelve length units.

The guide gear in the second alternative according to FIG. 2 consists again of the simple guide cage 30 in a form of thin circular wheel with uniformly on a harmonic circle spaced twelve circular holes, in which are located elastic annular insert 33 with turningly located spherical transfer elements 19. To a reduction of friction of the transfer elements 19 is on internal circuit of any insert 33 made a recess in operation serving like an annular lubricating chamber.

The third alternative of the guide gear according to FIG. 3 consists of a composed cage 30 created with two thin profiled circular guide plates 34, 36 concentrically mutually stitch together embossment welded joints 35, and further consists of annular inserts 33 with turningly placed spherical transfer elements 19, whereby the inserts 33 are located in mutually combined circular holes of both guide plates 34, 36. Also the third alternative of assembled guide gear are the centres of all twelve transfer elements 19 regularly distributed along the harmonic circle of the face rolling gear, so that all three drawn and described guide gears are in the first alternative of the rolling gear mutually exchangeable. Every guide gear is in

common front space between the transmission members 23, 24 stabilized through the transfer elements 19 in transfer grooves 21, 22.

Through the driving shaft 11 rotated driving transmission member 23 affects through pressure of orbits on the functional surfaces of their transfer grooves 21 on transfer elements 19. This pressure is through the transfer elements 19 transferred in orbits on functional surfaces of the transfer grooves 22 of transmission member 24. Action axial component of this pressure is taken up through a thrust antifriction bearing 28 of the driven transmission member 24, reaction axial component of this pressure takes up the thrust antifriction bearing 27 of the driving transmission member 23. Circumferential component of this pressure then effects a rotating of the driven transmission member 24 and of the driven shaft 12. The guide gear is in common front space between the transmission members 23, 24 stabilized through its transfer elements 19. By turning of both transmission members 23, 24 in transfer grooves 21, 22 keep generating and mating transfer elements 19 in substance their original circular configuration, whereby the guide cage 30 of the guide gear is through these moving transfer elements 19 set into rotation, the sense of which is the same like the sense of rotations of both transmission members 23, 24. The transfer elements 19 which are found in extreme positions and in cross points of the transfer grooves 21, 22 are on the contrary through acting of the guide gear displaced over these non unique positions into engagement zones, where are they properly regularly generated.

The face rolling gear according to above described first example is possible to use namely with controlling and securing mechanism, with positioning gear and handling equipment.

For explanation of the second workmanship of the gear equipment according to the invention here are used FIG. 4, FIG. 5 and FIG. 6. According to FIG. 4 in two-part box which consists again of two parts 13, 14, are turningly placed two mutually axially offset rotating transmissions members 23, 24 with combined cycloidal grooves 21, 22 arranged in adjoining front surfaces. In a common front space of these transmission members 23, 24 is located the guide gear with turningly placed spherical transfer elements 19, bilaterally intervening into both transfer grooves 21, 22.

The first transmission member 23 is through its axial holes stabilized and through unillustrated connecting agents fastened on a centre pin and on a shaft flange 51, created on the driving shaft 11. Similarly the second transmission member 24 is stabilized and fastened on a centre pin and on a shaft flange 52 of the driven shaft 12. The driving shaft 11 is with the transmission member 23 turningly placed in the box part 13 on two ball bearings 25. An outer bearing 25 of these two bearings, through its outer ring located in the bearing hole between a shoulder of cap 17 and a distance ring 15, is through its internal ring in a radial joint with the shaft 11 and an inside bearing 25, leaning frontally through its outer ring against a retaining ring 55, located in circumferential recess of the bearing hole, is also through its internal ring in a

power joint with adjoining front shoulder on the shaft 11. In the axial hole of cap 17, which is on the box part 13 fastened with the cap bolts 20, is arranged an internal circumferential recess for the first sealing ring 53, which prevents from penetrating of impurities into internal space of the rolling gear and from escape of lubricating medium out. Similarly the driven shaft 12, which is regarding the driving shaft 11 parallelly axially offset about a difference of the rolling radius, is together with the transmission member 24 turningly placed in the box part 14 on two ball bearings 26 too, where the outer bearing 26 between the shoulder of cap 18 and the distance ring 16, serves to catching of radial load, and the internal bearing 26 placed between the retaining ring 56 and a front shoulder of the driven shaft 12, is determinate to catching of radial and axial forces. In axial hole of the cap 18 fastened to the box part 13 through the cap bolt 20, is arranged an inside circumferential recess for the second sealing ring 54, which also prevents from penetrating of impurities into the internal space and from escape of lubricating medium out.

In a plane front surface of the first transmission member 23, adjoined to the common front space is created six regularly located simple pericycloidal transfer grooves 21, on the sides of which are arranged gothic functional surfaces. Similarly in a plane front surface of the second transmission member 24, adjoining to the common front space, is made nine regularly located simple hypocycloidal transfer grooves 22 with the gothic functional surfaces, arranged on their sides.

The guide gear according to FIG. 4 consists of the cage 30 in a form of thin circular disk with a stiffened axial hole and with uniformly roundnessly located seven circular holes, in which are turningly placed spherical transfer elements 19 and of a stabilizing group, which is turningly placed through the ball bearings 57, 58 in both transmission members 23, 24 and through a plain bearing in axial hole of the cage 30. The stabilizing group according to FIG. 4 and FIG. 5 consists of a double stabilizing crank 29, on internal guide pin 41 of which is located a bush 10. The stabilizing crank 29 is in this first alternative arrangement for assembling reasons divided into two crank parts, which are mutually positioned with a front claw with groove and the bush 10 and axially are combined through unillustrated connecting agents. The first crank part of the stabilizing crank 29 is in the bearing 57 at inlet transmission member 23 located through the first stabilizing pin 37, the second crank part of the stabilizing crank 29 is at outlet transmission member 24 located through the second stabilizing pin 38. Against an axial feed is the cage 30 in common front space secured through a front shoulder, arranged on adjoining surfaces of crank webs 39, 40.

In the second described example of the gear equipment is the first rolling diameter near the inlet transmission member 23 equivalent to six length units, the second rolling diameter near the outlet transmission member 24 is equivalent to nine length units and the pitch diameter of holes of the cage 30, that is here different from a harmonic diameter of both rolling diameters has a size of seven length units. At the second alternative, drawn in FIG. 6 is the

stabilizing group created with a solid stabilizing crank 29. Such a solid stabilizing crank 29 is advantage in cases, when the axial distance a of axis O_1 , O_2 of stabilizing pins 37, 38 and the axial offset e_1 , e_2 of axis O_3 of the guide pin 41 are relatively little. By turning of both transmission members 23, 24 in the transfer grooves 21, 22 the generating loaded transfer elements 19 put on the stabilizing crank 29 turningly placed cage into rotation, the sense of which is the same like a sense of the rotating motion of both transmission members 23, 24. Discharge transfer elements 19, which are found in point parts of the transfer grooves 21, 22 and out of an engagement field, are in the contrary through the rotating cage 30 between both transmission members 23, 24 continuously displaced in the engagement.

Arrangement of the guide gear in above described second example of the gear equipment enables in certain range to change a mutual ratio of size of the axial offsets 21, 22.

For explanation of the third example of the gear equipment according to the invention is used FIG. 7. In the two-part box consisting again of two frontly circumferentially connected box parts 13, 14, are mutually parallelly arranged the transmission members 23, 24, 63 in substance of a disk form. Both box-parts 13, 14 made of the welded semi-products, are to one another fastened with the fixing elements, which are here fastening bolts 40 and mutually positioned through unillustrated fixing elements. In a fixing flange 64 of the box part 14 are in regular spacing created fixing holes 43 for fastening of the face rolling gear to respective device. In adjoining front surfaces of the transmission members 23, 24, 63 are created mutually coupled combined cycloidal transfer grooves 21, 22, 71, 72. While on the inlet transmission member 23 and on the outlet transmission member 24, placed coaxially with regard to a central axis of this planet face rolling gear, are the face transfer grooves 21, 72 created unilaterally on a satellite transmission member 63, located with regard to this central axis eccentricly, are the face transfer grooves 22, 71 made on both front surfaces. In the first common front space of the transmission members 23, 63 is arranged the first guide gear with turningly placed spherical transfer elements 19, bilaterally intervening into both transfer grooves 21, 22. Similarly in the second common front space of the transmission members 63, 72 is arranged the second guide gear with turningly placed spherical transfer elements 70, intervening again bilaterally into the both transfer grooves 71, 72. The inlet transmission member 23 is located in the right box part 13 coaxially with the driving shaft 11, a satellite transmission member 63 is together with both guide gears turningly placed on an eccentric guide pin 41 and on eccentric stabilizing pins 37, 38, and the outlet transmission member 24 is coaxially frontally fastened on a charge flange 48 of a driving charge 47, turningly placed together with co-axial driven shaft 12 on anti-friction bearings 26, 28 in the left box part 14. Connecting agents, serving for fastening of the inlet transmission member 23 in the box part 13 and the outlet transmission member 24 on the charge flange 48, are not illustrated.

In the guide pin 41 a divided driving crankshaft 11 is in the box through its central lots turningly placed on antifriction bearings 61, 68, where the outer bearing 61 on one end of the driving shaft 11 is located in cylindrical hole of the non-turning inlet transmission member 23 and the internal bearing 68 on the second end of the driving shaft 11 is located in cylindrical hole of the turning outlet transmission member 24. the satellite transmission member 63 is on the guide pin 41 located through antifriction bearing 67.

Both crank parts of divided driving shaft 11, which are mutually positioned through a front claw with groove and a common bush 42 and axially connected through unillustrated connecting agents, are at the same time stabilizing groups of the guide gears. Between the satellite transmission member 63 and the inlet transmission member 23, arranged the first guide gear consists of the cage 30 in a form of thin circular disk with a thickened central part, in which is created an axial hole, and with uniformly circularly spaced fifteen circular holes, in which are turningly placed the spherical transfer elements 19, and further of the first stabilizing group, created through the right crank part of the driving shaft 11.

The first stabilizing group consists of a right half of the guide pin 41 with located common bush 42 of the stabilizing pin 37, when between the guide pin 41 and the stabilizing pin 37 is created the first distance arm shoulder, and further of linking up central lots of the driving shaft 11. Axis of the guide pin 41 and of the stabilizing pin 37 are mutually parallel, whereby eccentricity of the guide pin 41 with the bush 42 and the bearing 67 with regard to central lots of the driving shaft 11 is twice bigger than eccentricity of the stabilizing pin 37 with the cage 30 slidingly turningly placed against these central lots. To balancing of eccentrically located materials is to a face of the stabilizing pin 27 through unillustrated connecting agents fastened the first balancing segment 45, which serves at the same time together with the first arm shoulder to axial line of the cage 30 between the transmission members 23, 63.

Between the satellite transmission member 63 and the outlet transmission member 24 is located the second guide gear, which consists of a cage 60 in a form of thin circular disk with thickened central part, in which is created an axial hole and with uniformly roundnessly located spherical transfer elements 70, and further of the second stabilizing group, formed through the left crank part of the driving shaft 11.

The second stabilizing group consists of a left half of the guide pin 41 with the common bush 42 of a stabilizing pin 38, where between the guide pin 41 and the stabilizing pin 38 is arranged the second distance arm shoulder and further of respective linking central lots of the driving shaft 11. Axis of the guide pin 41 and of the stabilizing pin 38 are mutually parallel, whereby eccentricity of the guide pin 41 with regard to the central lots of the driving shaft 11 is twice bigger than eccentricity of the stabilizing pin 38 with slidingly turningly located cage 60 against these central lots. Regarding that, the sizes and eccentricity directions of both stabilizing pins 37, 38 are the same, in assemble state of the driving shaft 11 are these

stabilizing pins 37, 38 mutually co-axial. To balancing of eccentrically placed materials is to the front of the stabilizing pin 38 through unillustrated connecting agents fastened the second balancing segment 46, which at the same time together with the second arm shoulder serves to an axial linking of the cage 60 between the transmission members 24, 63.

While an internal ring of the bearing 67, located on the bush 42 is axially closed between arm shoulders, the outer ring of this bearing 67 is located in cylindrical axial hole of the satellite transmission member 63. Against effect of tilt moment is the satellite transmission member 63 on the bearing 67 bilaterally secured through internal shoulder and internal retaining ring. Internal space of the face rolling gear is from inlet side of the driving shaft 11 prevented from escape of a lubricating medium and against penetrating of impurities through a shaft seal 65, which is in the axis hole of the right part 13 located and secured through the bush 17, fastened through a cap bolts 59. On unillustrated inlet end of the driving shaft 11 is arranged a coupling for connection of the driving electromotor.

From an outlet side is internal space of the face rolling gear prevented partly through a sealing membrane 44, located in internal shoulder of the driving charge 47 and sealed through a distance ring 66 and partly through unillustrated sealing agents, locating on an outlet side between the left part 14 and the driving charge 47 of a driven shaft 12. Right end of the driven shaft 12 is in the driving charge 47 located with a spring 62, unillustrated left end of the driven shaft 12 is provided with a coupling for connection of a driven device.

In annular joint gap of the box parts 13, 14 is located an elastic annular adjusting element 49, determinate to filling of the joint gap and to filling of internal space of the face rolling gear. Fixing elements of the box parts 13, 14 formed here as a fixing bolt 50, serves at the same time to elimination of axial clearance and to elimination of wear, of rolling gearing, evtl. to adjustment of an axial preloading in the asked clearanceless travel.

In annular front surface of the inlet transmission member 23, adjoining into the first common front space, is created sixteen regularly located hypocycloidal transfer grooves 21, on the sides of which are arranged the gothic functional surfaces. Similarly in annular circumferential front surface of the satellite transmission member 63, adjoining to the same front space is created fourteen regularly located pericycloidal transfer grooves 22 with the gothic functional surfaces, arranged on sides. In the mentioned first common front surface of the rolling transmission members 23, 63 with mutually combined sixteen transfer grooves 21 and with fourteen transfer grooves 22 is thus turningly placed the first cage 30 with fifteen turningly placed transfer elements 19, bilaterally intervening into these transfer grooves.

Similarly in the annular circumferential front surfaces of the transmission members 63, 24, adjoining to the second common front space, is created sixteen pericycloidal and eighteen hypocycloidal transfer grooves 71, 72 with the gothic profiles of the functional surfaces. In the second common front

space of the rolling transmission members 63, 24 with sixteen and eighteen combined cycloidal transfer grooves 71, 72 is then turningly placed the second cage 60 with seventeen turningly placed roundness transfer elements 70, intervening bilaterally into the mentioned transfer grooves.

The dimensions of mutual corresponding axial offsets of the transmission members 23, 63 and the transmission members 63, 24 are equivalent to a difference of the respective rolling radius of the transfer grooves 21, 22 and the transfer grooves 71, 72.

The whole kinematic transmission ratio i of the face rolling gear is given by ratio between a number product of the transfer grooves 22, 72 and between a difference of the number product of the transfer grooves 22, 72 and the number products of the transfer grooves 21, 71. In drawings has then the planet face rolling gear the kinematic transfer ratio

$$i = \frac{18.14}{18.14 - 16.16} = -63.$$

A negative sign with evaluated kinematic transfer ratio i shows, that the driven shaft 12 has with regard to the driving shaft 11 an opposite sense of rotation.

The face rolling gear works thus: through an unillustrated driving electric motor driven with the driving shaft 11 turns through its central lots in the bearings 61, 68, whereby set in planet motions through its crank parts sections the satellite transmission member 63 as well as both cages 30, 60 around the central axis of the face rolling gear. By these planet motions, the satellite transmission member 63 through action of the transfer elements 19 is controlled generated along the adjoining front of the fixed inlet transmission member 23. Through a motion of the loaded transfer elements 19, which are found in the engagement field, is also driven the cage 30, which transfers out of the engagement field the discharged transfer elements 19 to engagement again. Through the controlled planet generating of the satellite transmission member 63 is driven at the same time the outlet transmission member 24 and thus also the driven shaft 12, whereby the transfer elements 70 generating in engagement field of the transmission members 63, 24 set into rotation the cage 60 again. Through a rotating of the transmission member 63 and cages 30, 60 around the guide pin 41 and the stabilizing pins 37, 38 as well as rotating of the driven shaft 12, have with regard to a turning of the driving shaft 11 an opposite sense. Axial pressure between orbits of the transfer grooves 21, 22, 71, 72 and the transfer elements 19, 20 is in a box of the planet face rolling gear caught from right side directly through a wall of the box part 13 and from left side through the thrust bearing 28 and the box part 14.

If functional surfaces of the transfer grooves 21, 22, 71, 72 and of the transfer elements 19, 20 are sufficiently hard, has the planet face rolling gear in a protected form very little internal friction. Such a property is really welcome with using in positioning and handling equipment, gears and tools, especially with tighteners. Regarding the possibility of an arrangement for clearanceless travel is this rolling

gear also applicable in a plant instrumentation and precision mechanics, further in machine-tools and forming machines, handling equipment and elsewhere.

- 5 The planet face rolling gear according to the invention makes possible to reduce an inlet angular speed up to hundred times, so that it is also possible to use in certain cases as a replacement for contemporary worm gear unit. With regard to these worm gear units has this face rolling gear in operation greater efficiency, less wear and in production enables to reduce power and material consumption, especially of non-ferrous metals. When using this face rolling gear for transfer of little outputs is even possible to use to a production of its parts including the transmission members 21, 63, 24 the plastics and further unusual materials. In such cases and also in other, less particular application is not necessary regarding a very good generating ratios, high efficiency and little heat production to use the lubricants. For little weight, simple operation, less production costs, less prices of plastics and a possibility of practical removal of lubricants is also possible to use the face rolling gear to advantage at low temperatures, in a dust and corrosive medium, in conveyances, transport device, etc.

CLAIMS

1. A gear equipment to transfer and transmission of rotating motion containing a pair of transmission members, on mutually adjoining front faces provided with face transfer grooves with antifrictionally placed transfer elements, wherein between cooperating transmission members 23, 24 in corresponding combined transfer grooves 21, 22 antifrictionally placed transfer elements 19 are uniformly roundness-ly spaced and turningly located in the guide gear, which is turningly arranged between these transmission members 23, 24.

2. A gear equipment as claimed in claim 1, wherein the guide gear creates a guide cage 30 with regularly circular arranged holes, in which are turningly placed the transfer elements 19.

3. A gear equipment as claimed in claim 1, wherein the guide gear is composed of the guide cage 30 with regularly circularly arranged holes, in which are in located inserts 33 turningly placed the transfer elements 19.

4. A gear equipment as claimed in claim 1, whereby the guide cage 30 creates in the main parallel and through connections 35 mutually fastened guide plates 34, 36, having mutually concentric and regularly circularly arranged holes in which are located inserts 33 for turningly placed transfer elements 19.

5. A gear equipment as claimed in claim 1, wherein the guide gear is composed of the cage 30, which is turningly located on a guide pin 41 of stabilization group, turningly arranged with regard to both transmission members 23, 24 and which has concentricly around its turning location on the guide pin 41 uniformly placed turningly located transfer elements 19.

6. A gear equipment as claimed in claim 5, wherein the stabilization group of the guide gear is created through a stabilization crank 29, which has on

its internal guide pin 41 turningly located the guide cage 30 and which is regarding to both transmission members 23, 24 turningly located through its border stabilizations pins 37, 38.

7. A gear equipment as claimed in claim 5, wherein the stabilization group of the guide gear is created through the stabilization crank 29 composed of two crank parts, which are near of its internal guide pin 41 mutually fastly connected.

8. A gear equipment as claimed in claim 1, wherein between frontally coaxially arranged inlet transmission member 23 and outlet transmission member 24 is there on eccentric guide pin 41 of a driving shaft 11 turningly located a satellite transmission member 63, whereby in the first common frontal space between the central inlet transmission member 23 and eccentric satellite transmission member 63 is on the first stabilization pin 37 of the driving shaft 11 turningly arranged cage 30 of the first guide gear for turningly located transfer elements and in the second common frontal space between eccentric satellite transmission member 63 and the central outlet transmission member 24 is on the second stabilization pin 38 of the driving shaft 11 turningly arranged the cage 60 of the second guide gear for turningly located transfer elements 70.

9. A gear equipment as claimed in claim 8, wherein the inlet transmission gear 23 is in a box arranged unturningly, while the inlet transmission member 24, fastly connected to a driving shaft 47 of the driven shaft 12, is in this box arranged turningly.

10. A gear equipment as claimed in claim 8, wherein the crank driving shaft 11 is through one of its central parts turningly located in a box or/and in the driving shaft 47 of the driven shaft 12, whereby eccentric stabilization pins 37, 38 and the guide pin 41 of the crank stabilization groups of both guide gears are on the driving shaft 11 arranged between these central parts.

11. A gear equipment as claimed in claim 8, wherein a size of eccentricity of the stabilization pin 37 of stabilization group of the first guide gear and the eccentricity of stabilization pin 38 of stabilization group of the second guide gear, with regard to the central parts of the driving shaft 11 is in substance twice less than a size of eccentricity of the guide pin 41, which is common to both stabilization groups, regarding these central parts.

12. A gear equipment as claimed in claim 8, wherein on the driving shaft 11 is oppositly with regard to both eccentric guide gears and also to eccentric satellite transmission member 63 eccentricly fastened one balancing segment 45, at least.

13. A gear equipment as claimed in claim 8, wherein mutual axial positions of the outlet transmission member 24 the satellite transmission member 63 and the inlet transmission member 23 are within a box adjustable through fixing elements and through one adjustable element 49 at least.

14. A gear equipment to transfer and transmission of rotating motion substantially as described herein, with reference to the accompanying drawings.

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